REVIEW ARTICLE

Patient-reported outcomes following a physiotherapy rehabilitation programme for atraumatic posterior shoulder subluxation

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ABSTRACT

Background There is a paucity of research that describes the patient-reported benefits of physiotherapy rehabilitation for atraumatic posterior instability despite non-operative treatment being considered the initial treatment of choice. This retrospective case series review describes the patient-reported outcomes following a physiotherapy rehabilitation programme for atraumatic posterior shoulder instability.

Methods Nineteen consecutive patients with a clinical diagnosis of atraumatic posterior shoulder subluxation completed our physiotherapy programme. All patients completed Oxford Instability Shoulder scores (OISS) and Western Ontario Shoulder Instability Index (WOSI) scores before and after physiotherapy intervention.

Results Patients reported a statistically significant clinical improvement in the main outcome measures following physiotherapy intervention. The OISS showed a mean improvement of 18.6 points, whereas the WOSI score showed a mean improvement of 37.2%. Following physiotherapy rehabilitation, all patients reported that their shoulder did not prevent them from performing their work/studies or their chosen hobbies/sports.

Conclusions Our results support the view that specialized physiotherapy rehabilitation is a valuable treatment option for atraumatic posterior shoulder instability and reveal significant clinically important improvements in patient-reported outcomes.

INTRODUCTION

Posterior glenohumeral instability presents clinicians with a complex challenge with respect to its diagnosis and management. Within the spectrum of posterior glenohumeral instability, atraumatic posterior shoulder instability is rare [1,2] and its cause is not fully understood. Numerous aetiologies have been implicated in its pathogenesis, from generalized ligamentous laxity to repetitive microtrauma to the posterior glenohumeral capsule and posterior band of the inferior glenohumeral ligament, to poor scapulothoracic mechanics and rotator cuff deficiency, to excessive glenoid or humeral retroversion and glenoid hypoplasia [1].

However, there is general agreement in the literature that atraumatic posterior glenohumeral instability should be treated initially with rehabilitation before any surgical intervention is considered [1,3,4]. Interestingly, the literature highlights a paucity of information regarding the effectiveness of physiotherapy in treating this type of shoulder dysfunction. This perhaps reflects the fact that there is no clear evidence to inform us whether one treatment strategy is better than another in these cases [2,5].

Often, reports of nonsurgical intervention for atraumatic instability have a heterogeneous cohort and there is a scarcity of published work that clearly describes the physiotherapy outcomes for patients with posterior glenohumeral instability [1,3]. Burkhead et al. reported on the treatment of glenohumeral instability with an exercise programme at an average follow-up of 46 months [6]. Of their patients with atraumatic posterior glenohumeral subluxation ($n = 16$), fifteen (94%) were described as having good or excellent results. However, no details are given as to the validity or reliability of the outcome assessment system used. Fronek et al., in a prospective case series of sixteen patients with atraumatic posterior glenohumeral subluxation, found that a physiotherapy programme improved ten (63%) patients, provided no help in two patients and failed in the other four cases at an average follow-up of 5 years [7]. It was noted that six patients were able to return to sport and other strenuous activities. These encouraging results were again obtained using an outcome rating scale, the validity and reliability of which is not discussed or known. Nonetheless, this work provides some insight into the outcomes that this subgroup of patients with posterior glenohumeral instability can achieve with physiotherapy intervention [6,7].

It has been recognized in recent years that methods are required to detail the patient's perception of their treatment because these may differ from those of the clinician [8]. Patients have been shown to be valid and reliable judges of

treatment outcome [9] and the use of accepted outcome measures is important if we are to further our understanding of treatment efficacy in posterior glenohumeral instability. Gerber stated 'The lack of a universally accepted, standardized system of assessing the overall value, or functional state, of a normal, diseased, or operated joint is one of the most important factors preventing progress in clinical orthopaedic research' [10].

The present study describes patient-reported outcome measures after a physiotherapy rehabilitation programme for the treatment of atraumatic posterior glenohumeral subluxation.

MATERIALS AND METHODS

Nineteen consecutive patients presenting with atraumatic posterior glenohumeral subluxation were treated with a physiotherapy rehabilitation programme. Two patients were excluded from the case series because, on pre-treatment assessment, they reported being unable to commence the physiotherapy rehabilitation programme and therefore did not receive treatment. One of these patients was returning home following studies and one patient planned to travel overseas for an undefined period.

All patients were assessed and managed between June 2005 and December 2011 and had a mean (SD) length of symptoms prior to physiotherapy intervention of 17.3 (12.6) months (range 6 months to 60 months).

Patients were diagnosed with atraumatic posterior glenohumeral subluxation based on a detailed history of their presenting condition and a physical examination [1,4,5]. The history specifically clarified the onset of the disorder and the position of the pain and apprehension experienced. The onset was judged to be atraumatic when the patient described an insidious clinical onset and could not recall any trauma or event that they felt was responsible for the presentation. No patients described frank posterior dislocation of the shoulder. On clinical examination, all patients had a positive posterior shear test, which is carried out by placing the patient supine with the arm in internal rotation, the shoulder in 90° flexion and the elbow flexed to 90°. The humerus is then loaded with a posteriorly directed force and the patient is asked whether this reproduces their symptoms when the examiner feels the amount of posterior translation [4]. This test is well tolerated by patients and helps to confirm the instability direction observed with active range of movement testing. All patients had a negative anterior apprehension test. Hegedus et al., in a meta-analysis, state that the apprehension test appears diagnostic for anterior instability [11]. The sulcus sign was grade 2 in all patients, indicating the amount of inferior laxity; however, this test did not reproduce any apprehension. All patients had asymptomatic cervical spine movements on testing and were free of any other upper limb joint symptoms. All patients were actively seeking help to manage their shoulder condition and did not appear to have any psychological issues related to their presentation. A number of patients did report being able to sublux the shoulder voluntarily; however, all patients were compliant with the need to stop this behaviour as part of managing their condition.

Patient-reported outcome measures

All patients completed Oxford Instability Shoulder score (OISS) and Western Ontario Shoulder Instability index (WOSI) scores at time of initial assessment and upon discharge as per our routine clinical practice.

The OISS is a 12-item questionnaire with five possible Likert style responses for each question and has a range from 0 to 48 (with a score of 48 indicating better shoulder function). The OISS has been developed and validated for shoulder instability and has also undergone testing to assess responsiveness in shoulder instability patients [12,13]. Moser et al. reported that a change in score of 7 points will reflect a true change above the error rate of the questionnaire and that a change in score above 6.5 points is likely to be clinically important [12].

The WOSI score is a 21-item questionnaire with a 100-mm horizontal visual analogue scale under each question for patient responses and ranges from 0 to 2100 and is converted to a percentage, with 100% representing the highest possible shoulder-related quality of life. The WOSI is a rigorously designed and evaluated measurement tool for patients with shoulder instability [14,15] and has been shown to have excellent responsiveness in posterior instability [16]. The WOSI score has been shown to be more responsive than other measures of shoulder outcome [15]. Kirkley et al. suggest a within-subject change of 10.4% represents a minimally clinically important change [14].

All patients completed the questionnaires independently and without assistance from the physiotherapist. The physiotherapist and/or parent did clarify any questions that the patient did not fully understand as a result of the language of the scoring system where necessary. For example, question 17 of the WOSI score asks about 'roughhousing or horsing around' and, for some, this required an explanation.

Physiotherapy programme

All patients were assessed by a single specialist physiotherapist from the shoulder and elbow unit team within an acute National Health Service teaching hospital setting.

Our physiotherapy programme has been described previously [3] and starts with a careful explanation to the patient of their shoulder condition. This education also involves strategies aiming to address pain, including advice on sleeping position. Once the patient has a good understanding of their shoulder problem and what the physiotherapy programme aims to achieve, rehabilitation commences, focusing on motor control movement re-education. This starts with proprioceptive static position sense training and progresses to simple dynamic motor control movement pattern relearning as tolerated by the patient. This is achieved with the use of closed circuit video camera feedback and mirrors to allow the patient to

see and understand the motor control movement pattern re-education. Once patients are able to control simple dynamic movements, they are progressed to functional movement pattern integration where normal daily activity motor control is re-educated. Rehabilitation exercises to improve the periscapular, rotator cuff and deltoid muscle stability, endurance and strength are incorporated and developed along with whole body core stability work. These are carefully integrated to ensure that the motor control movement pattern re-education is maintained when performing the rehabilitation exercises. Rehabilitation exercises are then progressed and tailored to the patient's occupational and recreational/sporting demands.

Statistical analysis

Descriptive statistics were used to present patient demographic details. The Wilcoxon signed-ranks test was used to compare the pre-physiotherapy and post-physiotherapy rehabilitation OISS and WOSI scores. The statistical package SPSS (SPSS Institute, Cary, NC, USA) was used to test this hypothesis with $p < 0.05$ considered statistically significant.

RESULTS

Nineteen patients completed our physiotherapy rehabilitation programme. Of these, ten were female, with a mean (SD) age of the whole group of 16.1 (2.3) years (range 13 years to 22 years). Seventeen patients were right-arm dominant. In ten patients, the right shoulder was affected, the left shoulder was affected in six cases and three patients described a bilateral presentation. In patients with a bilateral presentation, the worst effected shoulder on initial presentation was used for scoring purposes. The mean (SD) length of time spent under physiotherapy rehabilitation was 172 (165) days (range 1 day to 680 days).

On discharge from physiotherapy, all patients reported being able to return to their work or studies and returned to their hobbies and sports. Tables 1 and 2 show the stated occupation of the patients, along with the hobbies and sports that they described being involved in.

Figures 1 and 2 show the distribution of the OISS and WOSI scores pre- and post-physiotherapy rehabilitation.

Table 1 Patient occupation.

Occupation	Number of patients
Student	15
Warehouse operative	1
Heating engineer	1
Chef	1
Gym instructor	1

Table 2 Patient hobby and sport participation.

Hobby and sport participation	Number of patients
Football	7
Swimming	3
Golf	3
Netball	3
Badminton	2
Gymnastics	2
Rugby	1
Cricket	1
Tennis	1
Horseriding	1
Motor cross	1
Archery	1
Rollerblading	1
Explorer scouts	1
Air cadets	1

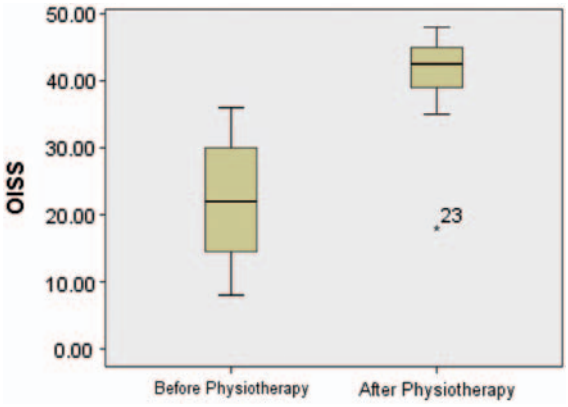

Fig. 1 Box plots showing before and after physiotherapy Oxford Instability Shoulder scores (OISS).

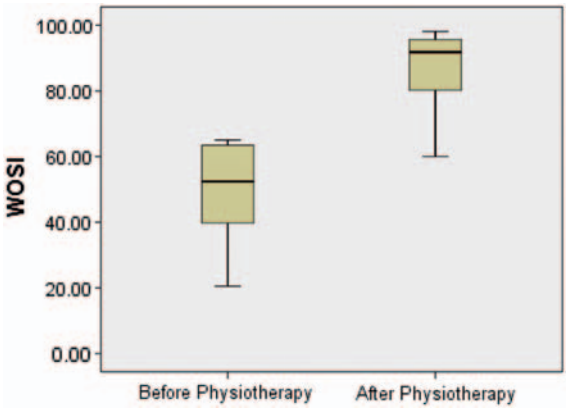

Fig. 2 Box plots showing before and after physiotherapy Western Ontario Shoulder Instability Index (WOSI) scores.

The mean (SD) pre-intervention OISS was 22.7 (8.8), whereas the mean (SD) post-intervention OISS was 40.9 (6.7). The mean improvement in the OISS was 18.6 points ($z = -3.73$, $p \leq 0.000$).

The mean (SD) pre-intervention WOSI score was 49.8% (14.2%), whereas the mean (SD) post-intervention WOSI score was 87% (11.3%). This represents a mean improvement in the WOSI of 37.2% ($z = -3.82$, $p \leq 0.000$).

DISCUSSION

These encouraging results show a clinically and statistically significant improvement following a physiotherapy rehabilitation programme for patients with atraumatic posterior glenohumeral subluxation.

Our results show a mean improvement in the OISS of 18.6 points, whereas the mean WOSI score improvement was 37.2%. Moser et al. suggest a minimal clinically important difference for the OISS to be 7 points, whereas Kirkley et al. report a clinically important change for the WOSI score to be 10.4% [12,14]. Therefore, our results suggest a significant patient-reported improvement and establish the clinical effect physiotherapy rehabilitation achieved in this small group of patients with posterior instability.

Interestingly, only one patient did not report a clinically meaningful improvement with one of the patient-reported outcome measures. One patient reported an improvement of only 6 points on the OISS, whereas the WOSI score improved by 26%. It is not clear why this occurred and may reflect something unique in this patient that highlights a difference in the sensitivities of the OISS and WOSI scores.

On completion of our physiotherapy rehabilitation programme, all of our patients felt able to manage their shoulder condition independently and had returned to their work and recreational hobbies/sport, as shown in Tables 1 and 2. None of our patient cohort reported involvement in professional or semi-professional hobbies/sport.

Our results are difficult to compare with previous published work as a result of the differing methods employed to describe outcomes. However, our results show all patients improved with physiotherapy rehabilitation, which appears to be a trend reflected by Burkhead et al. and Fronek et al. who found good/excellent results in 94% and an improvement in 63%, respectively, in their patient cohorts of atraumatic posterior glenohumeral subluxation [6,7].

The disparity seen between our results and the previously reported results could be a reflection of the length of follow-up or the differing rehabilitation approaches. The physiotherapy programmes described by Burkhead et al. and Fronek et al. depict a programme of strengthening exercises to the rotator cuff and deltoid [6,7]. Our rehabilitation approach places a large emphasis on patient education and movement pattern re-education, particularly addressing any scapular dyskinesis and muscle patterning problems. This is incorporated into our stability and strengthening programme for the periscapular muscles, the rotator cuff and deltoid, with importance placed on functional integration. It has been shown that this group of patients with posterior instability report scapular movement and muscle patterning faults and we feel that addressing these issues forms a vital part of our rehabilitation approach [17,18]. During rehabilitation, once patients learn to manage scapular movements and gain appropriate motor control, their instability is quickly improved. This movement re-education takes place quickly from one or two sessions and shows us clinically that the issue is not simply one of muscle strength and serves to reinforce the importance of appropriate scapular movement re-education and motor control in this group of patients with shoulder instability. That is not to suggest that muscle stability and strength are not important, because they clearly have an important role in ensuring optimal musculoskeletal function. Simply, the speed with which patients can learn to control their instability suggests a multifaceted problem beyond a philosophy of strengthening exercises.

This may also go some way to explain the length of physiotherapy rehabilitation that these patients require. In our experience, patients vary in their ability to learn the movement re-education and motor control that we expect and particularly the integration of these movements into normal daily life. This is not surprising because motor learning is multifactorial [19] and therefore an individual's capacity to learn will be unique to them. It is important that the rehabilitation programme continues as long as necessary for correct motor control to become established in all areas of a patient's lifestyle and function; the variability in the duration of our patient's physiotherapy rehabilitation could be a reflection of this motor learning time period. This means it is difficult to standardize a treatment time period for our rehabilitation programme because patients need a variable amount of time to learn.

Our patients had a clinical diagnosis with the history and examination being the cornerstone of the medical evaluation in this subgroup of posterior shoulder instability [1,20]. Atraumatic posterior shoulder subluxation is a diagnostic challenge because its aetiology is not fully understood. Validation studies of the physical tests employed to examine such patients are lacking; therefore, we have endeavoured to clearly describe the patient presentation and the clinical tests utilized for the current cohort. This was carried out in acknowledgment of the potential poor validity that the diagnosis has inherently, given the constraints of a lack of scientific knowledge in this area. Diagnostic imaging had not routinely been performed and, in this subgroup of shoulder instability, often presents normal findings [1,20]. We commonly reserve diagnostic imaging for when it is likely to change the decision-making process or add to the diagnosis. Of those who had diagnostic imaging before physiotherapy intervention, eight had plain X-ray evaluation, two had a magnetic resonance imaging investigation and three had magnetic resonance arthrography, all of which were reported as normal.

There are limitations to the present study. The rehabilitation was performed at a specialist shoulder and elbow centre and the improvements seen in patients may not be reflected in

differing care settings, whereas human error resulted in an OISS follow-up score for one patient not being collected. Being a small retrospective case series, we are unable to generalize our results and there was no control group. The natural history of posterior atraumatic shoulder subluxation is not well known and, despite the current cohort having a mean length of symptoms of over 1 year (17.3 months), it could be argued that the improvement seen may reflect the patient's condition simply getting better of its own accord. This confounder is difficult to control for because posterior atraumatic shoulder subluxation is a rare condition and the physiotherapy investigation of its benefits sparse.

Atraumatic posterior glenohumeral subluxation is rare and this series was a pragmatic attempt to capture the patient-reported outcomes of this disorder in an effort to further our understanding of how this condition responds to physiotherapy rehabilitation. There is also a need to recognize that the potential improvements seen are short term and, given the limitations discussed, we cannot assume that the change seen in the patient's condition is purely a result of the physiotherapy intervention and hence should be interpreted with caution.

Future work needs to prospectively follow such cohorts to determine outcome over the medium to long term. Currently, we do not know whether patients simply regress following physiotherapy discharge, maintain their reported functional gains or, indeed, whether they go on to improve over time. Future work could also look more qualitatively at these patients and study how they manage over the longer term. In patients with atraumatic posterior shoulder subluxations, is it a poor outcome if they still have occasional instability but understand their condition and are able to rationalize what this means and manage without difficulty?

Conclusions

Our case series has indicated the significant clinical improvements in patient-reported outcomes that a specialized physiotherapy rehabilitation programme can achieve when managing atraumatic posterior glenohumeral subluxation. These results support the view that rehabilitation is a valuable intervention when faced with such a patient presentation. By using accepted and standardized patient-reported outcome measures, these results may assist those designing future research work and help further our understanding of interventions to help manage this complex subgroup of patients with posterior shoulder instability.

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